

Memo One: Institutionalizing Reform Teaching
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In this memo, I reflect on changes initiated within an urban school district. I examine reform with reference to new ways of teaching mathematics and promoting teaching good mathematics instruction within this district. I look at the challenge of conveying and guiding an educational reform, especially in light of the “bandwagon” problem; teachers have seen many changes and recommendations arrive and leave without really accomplishing a lasting or substantive effect. Thus, teachers exhibit a broad and understandable degree of skepticism towards recommendations about how they should teach. Our project met with some unusual praise during the second and third years, resulting in a complex response from officials, lead teachers, and common teachers. This memo addresses some of these complexities.

Context of the LSC

Our LSC project, *PRIME*, was a K-5 Mathematics project in Peoria, Illinois. This project was a collaborative effort between the mathematics education faculty at Illinois State University (ISU), Peoria District 150, local business organizations and community service organizations. *PRIME* represented the third major grant project devoted to the professional development of teachers from Peoria District 150 beginning in the early 1990’s and extending through the year 2003. To our knowledge, prior to 1995, there had not been a significant, coherent mathematics-focused professional development program for District 150 teachers. The other two major grants, funded by the National Science Foundation, did not serve elementary teachers. First, the *LINKS* project was focused on geometry teaching in high school, and it served other districts along with this Peoria district. Thus, only a small portion of the mathematics teachers in Peoria were involved in this first grant. Secondly, *PUMP*, was focused on the education of practicing teachers. *PUMP* worked toward improved instruction in Algebra by addressing teacher’s content knowledge for algebra and their pedagogical knowledge and practices. While this project resided within District 150, it served only middle school teachers and some high school teachers, with less than 40 participating teachers in all. Historically speaking, these elementary teachers had professional development experiences that were not very cohesive nor were they integrated across time and between school buildings.

The superintendent for curriculum and instruction in Peoria was supportive when the project was first imagined in 1997. *PRIME* was designed in part as a response to the enthusiasm of administration officials at District 150. They wanted to build on the positive *PUMP* project outcomes and they were also concerned over recurrent low math scores for district elementary students. Beginning between 1995 and 1998, there were substantive gains by Peoria District 150 students on the Grade 10 mathematics exams, gains that were realized concurrently with the *PUMP* project and posted on the Illinois test of mathematics achievement in place at the time (known before 1999 as the IGAP, but now revised and known as the ISAT since 1999). The final report to NSF by the principal investigator, Jane Swafford, suggested that these gains could be associated with teachers’ gains in pedagogical content knowledge, and with their shifting attention toward

algebraic reasoning in classroom practices as commended by the project staff and as exemplified in project sessions.

Following such perceived success, district officials were supportive of a large-scale effort to address poor performances in mathematics by students in the district during early grades, especially Grade 5 as one of the principal assessment windows for the state achievement tests on mathematics. Officials believed that any work to prepare students for mathematical success in middle school would strengthen the potential for improving math achievement in high school. Furthermore, district officials were aware of a shift in assessment strategy in Illinois that emphasized the importance of having students write extended response answers to two new items on the state-level mathematics exams, both at Grade 3 and Grade 5. To place the performance of Peoria District 150 students in perspective statewide, note that the average math scores on Grade 3 or Grade 5 mathematics subtests had ranged consistently lower (by as much as 10 percentage points) than the state average throughout the decade of the 1990's.

The ensuing development of vision and objectives on which the PRIME project was based came from a group of teachers, administrators, and university faculty meeting with community development benefactors to explore possible grant sources and directions for professional development. That vision was proposed to the National Science Foundation, and eventually led to funding through the Local Systemic Change, Teacher Enhancement program of ESIE at NSF. However, while there had been administrators who were supportive and even acting in co-Principal Investigator roles, they were acting in the role of Assistant and Staff Member to the Superintendent, without necessarily representing the will of the School Board, or of the principals in the elementary schools. In fact, the principals in the elementary schools were not directly involved in the planning or writing of the grant proposal, nor were they made aware of the proposed professional development project in mathematics education and the possibility of introducing a set of designated instruction materials for teaching mathematics in their schools. Rather, they were informed of a reform-oriented professional development project that would engage their teachers in content workshops, summer institutes and that would provide a forum for collegial discussion and reflection regarding curriculum and pedagogical practices. Their response was broadly supportive, but in retrospect, it seems they did anticipate the broad implications of such a comprehensive professional development project.

Thus, in retrospect, the notion of focusing fundamentally on the implementation and elaboration of designated instructional materials coming from NSF-funded curriculum development projects (the *Investigations in Number, Data and Space* in this LSC project) as the basis of this professional development project was not adequately addressed with the entire community of decision makers in the district. In particular, the school board members, some teacher leaders, and most of the principals of the various schools did not grasp the central role of the reform-based curriculum within the grant as it was proposed and funded. Many of these leaders did not end up endorsing this extensive shift in the curriculum when they began to examine the implications for their teachers and students. But the story became more complicated when their were positive gains on State level mathematics achievement!

How was the reform promoted?

Here, I make a strong assumption that the reform effort recommended by our LSC was inextricably linked to the implementation of the reform-oriented instructional materials; the direction and magnitude of the response by this group of decision-makers in the district to the multi-phased implementation of the *Investigations* materials within the K-4 mathematics curriculum offers the clearest and most direct indicator of the overall response to reform efforts directed at the learning and teaching of mathematics in this district. I recognize that this is too strong of a connection to argue completely, but I think it is illustrative of the political negotiations that were relevant to the initiatives undertaken by project staff throughout the life of Project PRIME. After I take and develop this strong assumption to explain some of the challenges to the institutionalization of reform, I will eventually back away from the assumption. This may provide a broader summary of the project.

First, it is important to note that the district did invest significantly in PRIME by purchasing the *Investigations* materials (prior to the initial meetings of the PRIME Summer Institute in 2000). Note however that this purchase was carried out by the Superintendent's office of curriculum and instruction, but it was not submitted for consideration or approval before the School Board (as would have been the case with an adoption of a new curriculum). Rather, it was carried out as a purchase of supplementary materials for instruction in mathematics, mandated directly through the superintendents' office. This was within the authority of the superintendent's office within this district.

In this scenario, a majority of the Peoria teachers were somewhat surprised by the introduction of a new set of curriculum for teaching mathematics introduced during the Summer Institute 2000. But for the teachers in this school district, accustomed to using another established text series (Addison Wesley Elementary Mathematics had been adopted and purchased in 1995, and the next adoption for a mathematics text was several years off still at that time), this introduction of a different, and indeed an atypical math text series seemed foreign and perhaps un-necessary. Such reactions by teachers became apparent throughout the weeklong institute. Many teachers asked the seminar leaders, "Has the district adopted the *Investigations* curriculum, or not?" The teachers pointed out that the district adoption process had not been used; they were understandably hesitant to implement a new curriculum, even in phases, without some formal announcement from the school board. While we explained that the *Investigations* materials were intended as a resource to complement the Addison Wesley materials already in use, the teachers still wanted someone to identify a single source of curriculum. Our approach was to redirect their image of the curriculum to published learning standards for mathematics in Illinois (the Illinois Learning Standards, available at ISBE) and to rely fundamentally on their own Grade Level Quarter Plans and Unit Plans (developed and maintained within their own district). Next, I explain our work with one particular grade-level group of teachers through our PRIME Summer Institutes as a way of showing this tension over the curriculum in use.

As one of the project co-principal investigators from Illinois State University, I worked directly with the Grade 4 teachers during the summer institute. Many grade 4 teachers were leaders in their school buildings since they taught the most advanced grade level in their building; these leaders were quite hesitant to phase in the new instructional materials without formal authorization. As seminar leaders in the summer institute, we invited the district curriculum leader (as established under the direct authority of the Superintendent for curriculum, an assistant superintendent in District 150) to address this concern among all the teachers. She did so, and explained that the focus of curriculum should be on teaching mathematics in keeping with the state Learning Standards, and in keeping with the established set of math quarter plans for each grade level in Peoria. She explained that these instructional materials would be critical in providing good tasks, helping teachers see ways of engaging students in mathematical work and reasoning, and in helping teachers learn to assess and attend to students' actual thinking and strategies. These are the themes of the PRIME project, and this would provide the substantive line of argument for developing reform-oriented sessions, and for promoting reform-based instruction the classrooms across the district. But her argument was not widely accepted. Resistant teachers seemed unconvinced that there was an adequate mandate from their district for "our reform curriculum". There were some teachers who appeared to appreciate the argument and they chose to participate more completely in project initiatives based in the *Investigations* work.

Concurrently, teachers began to marginalize the reform by implementing it as a supplementary tool in their collection of lessons: they developed language to speak of "PRIME mathematics lessons" which signaled that the PRIME approach was different, and applicable to a subset of their lesson planning and implementation. For teachers thinking this way, they were still teaching from Addison Wesley in the same way they would have taught before, except when the special topics of measurement or geometry came up in their curriculum plan. In these cases, they would check their collection of PRIME lessons to see if they might insert the special lesson into the standard sequence of ongoing mathematics teaching based on the traditional text (Addison Wesley, 1995). We noticed that this was happening in the academic year classroom visits and in the academic year seminars during the subsequent semesters (2000-2001). Apparently, since the district officials would not authorize this use of instructional materials as an adoption, but merely as a set of supplemental curriculum tools, the teachers believed they were not required to take the reform proposals as a shift in mathematics, but only as a temporary "bandwagon".

A brief overview of district events between 1999 and 2004 is pertinent for this consideration of institutionalizing reform in mathematics teaching and learning within this district. There was a change of leadership with a retirement of the Superintendent of Schools in late 2001. Around this time, the superintendent of curriculum and instruction also changed, being replaced with a staff member who was not given the same level of authority, but who was assigned most of the responsibilities of the former assistant superintendent. A very aggressive superintendent was appointed by 2002, and this new leader was dismissed in 2004. During that persons' tenure, the teachers were called upon to implement a new reading program in the elementary schools, one that involved

intensive professional development activities. This interrupted our professional development activity related to mathematics during the 2002-2003 school year.

But this skeptical response to Investigations and to PRIME as a comprehensive movement toward reform mathematics instruction shifted substantially as reports of improved student achievement on state-level exams became available, first in the Fall of 2001 with a 10 percentage point gain and then again in the Fall of 2002 with a further gain of 13 more percentage points. As explained in the preceding paragraph, there was a strong emphasis on the importance of adopting a new, comprehensive reading text/curriculum series in the elementary schools during the 2002-2003 time period. Yet, it was in the Fall of 2003 that the third consecutive year of performance gains on the ISAT for Grade 3 and Grade 5 mathematics were released, highlighting unusually strong performances by Peoria students. Peoria District 150 students posted significantly higher scores in grade 3 than in previous years; the average performance of Peoria grade 3 students exceeded the average performance of grade 3 students throughout the state for the first time ever on the 2003 exams. PRIME was given very favorable reviews as a professional development program within the district, beginning in 2001 but especially by 2003. Even at the State level the educational administrators commended PRIME.

Peoria school officials, teachers, and school board members commended the “PRIME model of professional development” even recommending it for application beyond mathematics in topics such as reading and social studies. This promotion was ironic, since the model was not clearly described by these proponents, and many of them had been unwilling to endorse the adoption and systemic implementation of the designated instructional materials for PRIME. We worked to harness this positive press, but found that it was difficult to interpret the central elements of PRIME once they had taken on this new importance within the district’s communication system as “the PRIME model” without a complete connection to the actual project elements of professional development. In conversations with various district leaders, they seemed to represent PRIME only in partial form, thinking only of summer institutes, and the development of a small group of teacher leaders; thus, the most visible elements of the professional development work tended to eclipse the rest of the project.

Strategies for Addressing Misunderstandings and Resistance to Reform

Linking Summer Institutes to Academic Year Visits. First, within the design and practice of our own meetings for summer institutes and academic-year seminars, we called teachers to share and report on their specific findings of student reasoning, of students records of thinking about the mathematical concepts, and we asked teachers to show us their ways of implementing reform lessons by teaching directly from the *Investigations* lesson sequences. Thus, we worked to establish a cycle of example, explanation, implementation and then reporting to colleagues as a way of bridging between summer institutes and academic year seminars. This was a way of reminding teachers what they had thought about and experienced during the summer institutes. Academic year seminars consisted entirely of having teachers share the student writing samples and drawings, along with narrative accounts of their experience with the activities prescribed in

assigned lessons from the *Investigations* materials. These practical implementation seminars were meant to be an assessment of what teachers had tried to apply to their own teaching practices and a support system for teachers as they were able to listen to their fellow teachers experiences and share their own struggles and success. When the project staff conducted these academic year seminars, they collected sets of student work from each teacher and asked them to show how the lesson fit into their district-defined quarter plans for their grade level.

Quarter Plans as Cues for Phasing in Investigations. It may be helpful to elaborate on the critical role of quarter plans and the negotiations that surrounded these documents. Quarter plans are a term we use to describe a one-page scope and sequence document that fits the essential outline of the topics to be addressed in a given school year, all on one letter-sized sheet of paper. We used quarter planning as an organizing tool to convey our expectations for a phasing in of the reform-based curriculum. But more importantly, we used quarter planning to address a disconnection between summer institute work and the everyday teaching practices of project teachers. We became immediately aware of this as the mentors visited teachers' classrooms during the initial Fall of 2000 and the Spring of 2001. Working on quarter plans at each grade level was a critical strategy for promoting a change in perspective and led at times to actual growth in promoting the implementation of Investigations lessons.

Defining Good Tasks. One of the three PRIME key ideas was the claim that mathematics instruction must elaborate on good mathematical tasks rather than mere collections of practice exercises. As project staff realized that teachers needed to have a motivation for engaging in the Investigations tools, we decided to assess teachers' thinking about good tasks. If teachers could not articulate, identify, or write good mathematical tasks for themselves, they would be hard-pressed to appreciate such lesson suggestions, and resistant to using such lessons. Thus we checked and found their knowledge of good mathematical tasks to be quite weak and poorly articulated. We worked on this by deliberately selecting Investigations lessons that would serve as examples of strong tasks. We had teachers work through the tasks, envision the response of their own students, and then work through the task to prepare to lead their own students. Finally, we challenged them to bring evidence of student thinking on these tasks to subsequent project meetings during the school year. We also found it was important for our PRIME staff to continue daily conversations about the teachers' developing knowledge and conceptions of "good tasks" within particular content areas (geometry, algebra, statistics, etc) before and after each summer institute session. This helped to stabilize and bring coherence to the definition of reform teaching among our graduate assistants, district curriculum officials, and university faculty.

Teacher mis-understanding of reform practices and documents

During the first summer of the project, PRIME focused on Geometry and Measurement. While there were some teachers who used the Geometry and Measurement units from Investigations directly as replacement units instead of sections from the Addison Wesley texts they had been using before, there were few that did so. Rather, during the first school semester of the project, teachers tried out measurement or geometry lessons when

the project staff visited their classroom, but often only as a way of satisfying a requirement for the visit. They wondered out loud whether they could teach regular mathematics lessons, or whether they were expected to teach these “PRIME lessons” indicated how little they were inclined to integrate the reform practices we had modeled during the Summer Institutes; for them, PRIME was a stand-alone set of processes for doing special geometry and measurement lessons. Some teachers asked if they would ever find PRIME lessons on number or operations with number.

The project staff worked to answer these struggles for integration, responding with explanations about the relevance of PRIME and *Investigations* units as examples of general processes for teaching mathematics, but teachers seemed to have persistent images of PRIME as a set of “magical activities” for supplementing their standard curriculum. For many teachers, the second summer institute focus on number and operations provided the first opportunity to understand that PRIME was intended to address all of mathematics instruction. It seemed for most teachers to be an “eye-opener” since they could now see that *Investigations* and PRIME were intended as a comprehensive curriculum addressing what they thought of as the critical core of elementary mathematics, computation and number facts rather than merely serving as alternate collections of geometry lessons.

The classroom visits. Classroom visits were conducted by graduate students or one of the principal investigators. Each teacher received 4-6 visits per year. The visits varied with the staff person, although they were focused around the PRIME principle ideas: using substantive, rich tasks to address a key concept, listening to student thinking, and promoting student engagement with the tasks. The variation ranged as some worked as coaches, others provided examples by teaching model lessons, and still others served as educational consultants and reference librarians, providing collections of lesson ideas. Some staff merely watched the teacher conduct her lesson and followed up the observation with some questions or suggestions for improving the lesson. This variation across PRIME staff members was problematic, especially when staffing had to be changed due to attrition or re-assignment (limitations of graduate assignments at our university limited the duration of a graduate assistantship without a teaching assignment in the undergraduate program to one year). Thus, classroom teachers had to adapt to very different ways of coaching or helping them through these classroom visits.

Retrospective Evaluation

In working to promote the institutionalization of reform within the Peoria schools, there were a few key elements that emerged from this retrospective viewpoint. First, the notion of a mathematics *curriculum* was open to interpretation, and its interpretation proved critical to the success of the professional development process with teachers in their schools. Many teachers seem inclined to spend their time with fellow teachers in debates about scope and sequence, or about the selection of a new text to replace the existing text series. These were wasteful discussions of curriculum for the most part. In contrast, when challenged to talk with colleagues about the way students had learned some critical mathematical concepts, or to discuss the strategies observed among their students, teachers shy away and retreat to other topics. We found that providing a definition of

curriculum by writing quarter plans and outlines of units of instruction on topics from the quarter plan could help eliminate extensive debate while providing an adequate foundational outline for developing lessons for each new week and each new day. This helped eliminate wasteful arguments over choosing new textbooks or debates over scope and sequence. Thus, we could devote professional development time and attention to student thinking, developing substantive tasks to engage students, and ways of interpreting students' strategies on such tasks.

Developing a cadre of teacher leaders helped to convey and establish elements of reform. During the second and third years of the project, we had a leadership seminar that developed under the guidance of one of the graduate students who chose to follow her one year term as a staff member with a graduate thesis focused on promoting the growth of teacher leaders in professional development settings. This group eventually helped define some of the tendencies of the teachers in our project: some moved positively into investigations of themes of mathematical reasoning about intervals, or algebraic concepts, some used lesson study as a tool to think more closely about student learning in their own classrooms, and others chose rather to develop extensive curriculum maps and sequence guides, along with assessment instruments based on a skill-oriented view of the learning of mathematics. This latter group eventually moved from their emphasis on developing curriculum plans into the writing of assessment instruments for use in their schools as quantitative, multiple choice tools to check for mastery of skills in keeping with their curriculum guides. But it has been the former group of lead-teachers who have sustained PRIME through the orientation of new teachers in the district during subsequent years, through seminars, and by supporting fellow teachers in their buildings more than any other single on-going element of PRIME's programs.

The problem of testing mandates and school policy priorities is relevant to understanding the response of the district to our project. Our emphasis for teachers was to teach from curriculum guidelines such as the quarter plan (as terse as a single sheet of paper with a quarter plan for all mathematical topics and relative time for that topic). From these documents, teachers developed substantive unit plans and sequences of daily activity out of the *Investigations* materials or something that would follow the pattern of finding substantive tasks, support student engagement, and allow opportunities for teachers to attend to student thinking and strategies and develop mathematically rich conversations or arguments. But the district began around 2001 and 2002 to counter this emphasis from our grant by telling teachers that they would soon be expected to have students ready for annual, and eventually for weekly standardized testing in their classrooms. This led teachers to concentrate all the more on skills and procedures implicated by the evolving set of curriculum guides and especially the district-authored content tests at the annual, unit and weekly levels of frequency. While we worked to engage district officials in direct arguments and discussion over the potential benefits of these different mindsets regarding the mathematics classroom teacher's work and emphasis, the outcome was that the teachers moved more and more away from their attempts to learn to teach in the new curriculum by 2002 and 2003. District officials were unwilling to recognize the conflict we wanted them to recognize between professional development based in reform math

education and the practice of teaching lessons targeted directly toward state and district tests.

In retrospect, I would look for better way to engage with the entire set of decision makers in planning and designing this magnitude of a project. I think it would have been more effective to have engaged the school board and a representative committee comprised of elementary school principals in discussions over the design of the grant during the proposal phase. The superintendent's office had the authority, but lacked the mandate of the educational community of practice within the district to address the shift toward adapting a different curriculum model as embodied in *Investigations*. Of course, I recognize that this might well have met with extensive debate, and perhaps with a flat rejection of the option. Key elements in our struggle to define and carry on reform at the level of institutional change included: defining reform by introducing and implementing lessons from a reform-based set of instructional materials, establishing curriculum at the level of unified quarter outlines, with unit plans and unit assessment instruments, and finally by establishing a cohort of teacher leaders who understood the key aspects of the reform.

In the final outcome, the teachers grew as they worked to understand mathematical ideas and the ways their students were thinking as they met those same ideas in their schools. The students who studied with teachers who engaged in the PRIME project for at least one year were provided with a significant advantage over students whose teachers had not participated in any PRIME professional development. While it may be argued that the teachers grew because they were being encouraged, and other types of program might have produced a similar gain, that is speculative. We can see that the use of the *Investigations* curriculum helped define and convey the reform of mathematics teaching. In particular, we conveyed the themes of PRIME through this curriculum tool: defining and elaborating good mathematical tasks, attending to student thinking, struggles and strategies, and engaging students in the actual work of mathematical tasks and exploration rather than merely imitating teacher strategies.

Appendix:

Definition of Terms: *Institutionalization and Reform*

This memo is intended to address the topic: *institutionalization of reform*, especially from the context of one particular LSC with the intention of finding lessons that may apply broadly where further professional development projects may meet similar challenges. Thus, I begin by defining these two terms. First, *reform* denotes the process of change and development in which some process or institution is changed in a positive way. I note first that arguing that a change will be in a positive direction is always a subjective claim. I also note that the very notion of reform only makes sense when there is a definite period of time in which there is a sustained effort to change some institutionalized process or practice, implying that some measurable dimension or characteristic of an institution or system has shifted from one state into a different state along some continuum. It would be absurd to speak of *perpetual reform*. Secondly, *Institutionalization* refers to the extensive, comprehensive and longitudinal dimensions of a change within an entire system of a social and cultural entity.